



PERSPECTIVES

Meteorologist Suggests What Not to Do Ahead of and During Tropical Cyclones

Our perspectives feature the viewpoints of our subject matter experts on current topics and emerging trends.

INTRODUCTION

Hurricane season is once again upon the North Atlantic basin, and coastal communities will potentially undergo a considerable test of emergency procedures when preparing for and responding to an approaching tropical cyclone. Even with a perfectly polished emergency action plan combined with a high-confidence weather forecast, communities must still face a highly variable and unpredictable element: public response.

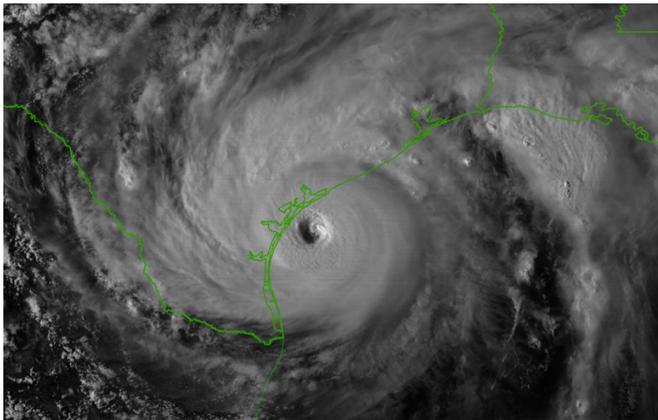


Figure 1 - Hurricane Harvey approaching the Texas Gulf Coast on August 25, 2017, at 5:07 PM CDT (Source: NOAA Archives/Weather & Climate Toolkit).

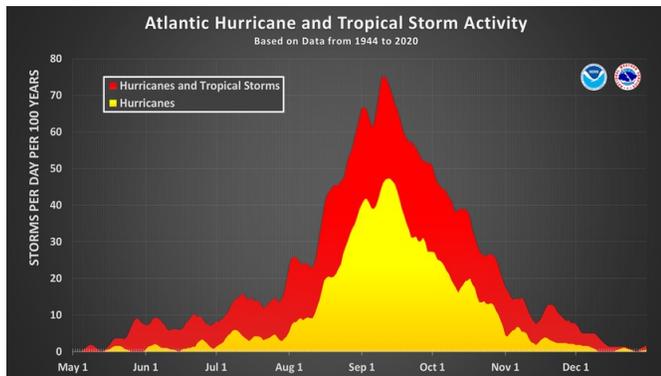


Figure 2 - Climatology of hurricane and tropical storm occurrence in the Atlantic Ocean (Source: National Hurricane Center).

While community preparation for tropical weather often differs based on many variables across storm-prone areas, there are some common good practices to implement:

1. Know the storm- and flood-prone areas and create evacuation zones accordingly.
2. Communicate clearly and regularly with residents and businesses about the emergency plan.
3. Have a relief shelter in a safe area with provisions and back-up power.
4. Stay in contact with partner agencies and the National Weather Service.
5. Request additional resources ahead of time for rescue and recovery operations.

Even in areas which are experienced in hurricane operations, the unpredictability of the human element can lead to significant issues such as confusion, contradicting information, complacency, and even panic. Rappaport and Blanchard (2016)¹ noted that indirect deaths associated with a wide variety of factors related to tropical cyclone human activity accounted for about 44% of deaths associated with tropical cyclones.

WHAT NOT TO DO IN PREPARATION OR RESPONSE TO A TROPICAL CYCLONE

Instead of focusing on what the public should be doing, we feel it is appropriate to focus on the common activities surrounding tropical weather that untrained professionals should not be doing:

1. **Forecasting alternate hurricane tracks.** The official forecast for tropical cyclones (which includes hurricanes and tropical storms) is the job of the National Hurricane Center. While there are now many websites with weather models available for public-use, models can be widely variable and misunderstood by untrained professionals. The National Hurricane Center is, therefore, the official

¹ Rappaport, E. N., & Blanchard, B. W. (2016). Fatalities in the United States indirectly associated with Atlantic tropical cyclones. *Bulletin of the American Meteorological Society*, 97(7), 1139– 1148. <https://doi.org/10.1175/BAMS-D-15-00042.1>

source of tropical cyclone intensity and track in the North Atlantic and Central and East Pacific basins.^{2,3} It is cautioned that freelancing forecasts, especially those by untrained, non-professionals, create doubt, mistrust, and confusion, and can in some cases be life-threatening if acted upon.

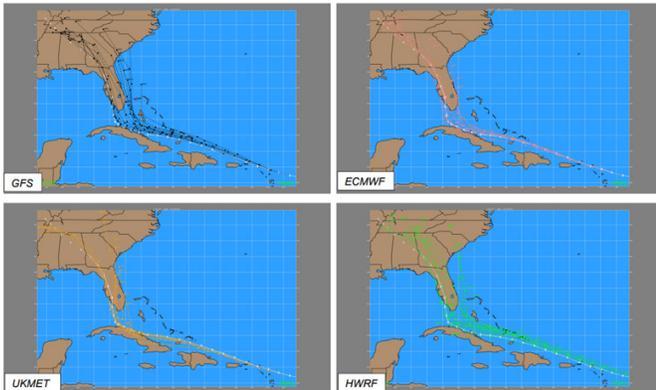


Figure 3 - Model forecast tracks regarding Hurricane Irma in 2017 (Source: National Hurricane Center Tropical Cyclone Report on Hurricane Irma [Updated September 24, 2021]).

2. Focusing too much on the “cone.” The tropical cyclone cone is one of the most iconic weather forecast graphics in hurricane-prone areas. However, the cone does not encompass the entire storm—only a range of locations where the center (“eye”) of the storm is likely to progress based on a 67% probability.⁴ It is well-known that powerful wind speeds, rainfall, storm surge, flooding, and embedded tornado potential all occur outside of the eye of the storm, thus anyone assuming the cone to represent the entire “danger area” is making an incorrect assumption.⁵

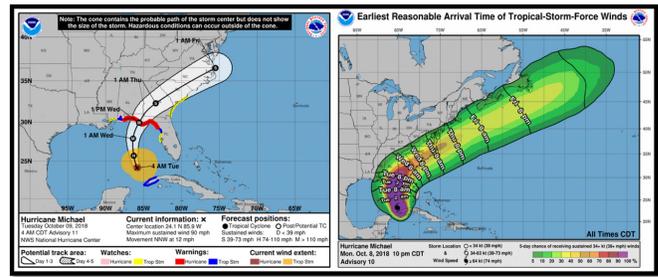


Figure 4 - Hurricane Michael (2018) Advisory 11 with cone and wind field (left) and most-likely wind speed and timing (right) (Source: National Hurricane Center Archives).

3. Being complacent. In tropical cyclone-prone areas, people can sometimes become complacent. Mr. Ken Graham, the former director of the National Hurricane Center and the current director of the National Weather Service stated that “a lot of your perception of your risk is based on your experience.”⁶ For example, if a resident survived a Category 3 hurricane unscathed previously, that resident may assume that he or she would be able to withstand a similar or lesser-intensity hurricane again.⁷ Unfortunately, that is a gross misunderstanding. Hurricanes are often unique even if they are of the same caliber. Wind swaths can be different. Storm surge, rainfall, flooding, and tornadic activity can be different. In fact, some of the most costly and destructive hurricanes in the United States were Category 3 storms and below at official landfall, including Hurricanes Katrina, Sandy, Ike, Ivan, Wilma, Florence, and Rita.⁸

Additionally, the category of the hurricane is based on the fastest sustained wind speed somewhere in the storm and is usually isolated and rarely felt on land (due to friction). Winds within hurricanes can be variable as well. A 20-mile difference in the landfall location of a tropical cyclone—even of similar caliber—could mean considerable differences in the measured wind speed, direction, storm surge, and so forth in one area.

² <https://www.nhc.noaa.gov/modelsummary.shtml>

³ Congressional Research Service. Forecasting Tropical Cyclones: NOAA’s Role, (Updated August 10, 2022): <https://crsreports.congress.gov/product/pdf/IF/IF10719/6>

⁴ <https://www.nhc.noaa.gov/aboutcone.shtml>

⁵ Craig Setzer, Association of Certified Meteorologists. Published November 14, 2022: <http://certifiedmeteorologists.org/news/hurricane-cone-of-confusion.htm>

⁶ KPRC-2 News Interview with Ken Graham: <https://youtu.be/tcGeStidTLM>

⁷ Zhang, F., and Coauthors, 2007: An in-person survey investigating public perceptions of and responses to Hurricane Rita forecasts along the Texas coast. *Wea. Forecasting*, 22, 1177–1190, <https://doi.org/10.1175/2007WAF2006118.1>.

⁸ <https://www.ncei.noaa.gov/access/billions/dcmi.pdf>



Figure 5 - Destruction following Category-2 Hurricane Ike in 2008 (Source: NOAA/<https://www.noaa.gov/jetstream/tc-potential>).

4. Hoarding. Provisions can be limited during and following a natural disaster. Storm kits, non-perishable foods, clean water, required medications, adequate clothing, and gasoline are all important to have to survive. However, we encourage all those in the path of a natural disaster to only purchase and stock what is needed for them, their loved ones, and others they may care for in their neighborhood. Hoarding provisions, otherwise known as “panic buying” or “consumer stockpiling,” which is common leading up to tropical cyclone emergencies,^{9,10} can deplete inventories to a point where those truly in need may be without adequate provisions.

5. Storm chasing. With the rise of social media, it is not uncommon to see unnecessary dangerous activity by non-professionals; for example, filming too close to the ocean with storm surge and high surf ongoing, bracing oneself in the wind for a photo opportunity, and/or driving in highly hazardous weather conditions (wind, rain, flooding, etc.). In fact, being outside during a hurricane can be extremely

dangerous due to flying debris, downed trees, downed power lines, rushing water, and much more.

According to Rappaport and Blanchard (2016), 20% of indirect tropical cyclone deaths were related to vehicle accidents of some sort, 4% were due to falls, and 5% were due to electrocution such as from downed power lines. Rappaport (2014)¹¹ found that almost 90% of direct fatalities were due to excessive stormwater—largely storm surge and flooding—often leading to drowning deaths.



Figure 6 - Storm surge at Fort Myers Beach during Hurricane Ian (2022) (Source: National Hurricane Center Tropical Cyclone Report on Hurricane Ian [published April 3, 2023]; Further credit to Max Olson).

6. Evacuating to the wrong side of the storm. In most cases, the strongest winds, tornado threats, and storm surge associated with a tropical cyclone occur in the right-front quadrant.¹² Additionally, the most affected areas from a tropical cyclone are generally coastal and low-lying areas.¹³ While it may seem like common sense, it is generally appropriate to evacuate to higher ground, usually in a direction that will be on the storm’s left-

⁹ Owen Kulemeka (2010), “US Consumers and Disaster: Observing “Panic Buying” During the Winter Storm and Hurricane Seasons”, in NA - Advances in Consumer Research Volume 37, eds. Margaret C. Campbell, Jeff Inman, and Rik Pieters, Duluth, MN : Association for Consumer Research, Pages: 837-838 .

¹⁰ Pan, Xiaodan & Dresner, Martin & Mantin, Benny & Zhang, Jun. (2019). Product Availability, Consumer Stockpiling, and Hurricane Events: Empirical Evidence From a Natural Experiment. SSRN Electronic Journal. 10.2139/ssrn.3309457.

¹¹ Rappaport, E. N., 2014: Fatalities in the United States from Atlantic tropical cyclones: New data and interpretation. Bull. Amer. Meteor. Soc., 95, 341–346, doi:10.1175/BAMS-D-12-00074.1.

¹² <https://www.nhc.noaa.gov/prepare/marine.php>

¹³ <https://www.noaa.gov/jetstream/tc-hazards>

hand side as it makes landfall. However, checking the official wind speed forecasts, storm surge forecasts, and excessive rainfall and flooding forecasts for a particular storm is always advised before choosing an evacuation route and destination, as, again, each storm is unique.



Figure 7 - The right-front quadrant of a tropical cyclone (Source: National Hurricane Center).

- 7. **Running generators indoors.** According to Rappaport and Blanchard (2016), carbon monoxide poisoning—largely due to the misuse of generators following the loss of electrical power—resulted in about 5% of the indirect deaths of Atlantic tropical cyclones. The Center for Disease Control recommends that generators be operated at least 20 feet away from a house.¹⁴
- 8. **Shooting at the hurricane.** It should go without saying, but discharging a firearm at a hurricane will neither weaken nor intimidate the storm. It may, however, result in a safety hazard to neighbors downrange.



Figure 8 - Twitter response from @PascoSheriff (Pasco County, Florida) regarding a planned event to shoot at Hurricane Irma in 2017.

CONCLUSION

We’ve focused on eight things no one should do when a tropical cyclone is approaching. So, what should be done? For further reading, we suggest visiting the [National Weather Service safety website](#) and consulting with local authorities and emergency management professionals. For municipalities, school districts, hospitals, and large gathering areas such as sports complexes, shopping malls, airports, and amusement parks, we also encourage the StormReady® certification through the National Weather Service.¹⁵ Expert meteorologists at J.S. Held, LLC are available to assist in this process.

¹⁴ <https://www.cdc.gov/co/guidelines.htm>
¹⁵ <https://www.weather.gov/StormReady>

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